

August 13, 1969

## Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided.

- On a blueprint for a room, the scale is 1 inch = 2 feet. If the length of the room measures  $3\frac{1}{2}$  inches on the blueprint, what is the number of feet in the actual length of the room? 1.....
- If  $rs = 0$  and  $r \neq 0$ , what must be the value of  $s$ ? 2.....
- Three readings of a thermometer were  $-3^\circ$ ,  $+13^\circ$ , and  $-7^\circ$ . Express in degrees the average of these readings. 3.....
- A point with coordinates  $(2, k)$  lies on the graph of the equation  $3x + 2y = 14$ . What is the value of  $k$ ? 4.....
- A family spends 25% of its total monthly income for rent. If \$116 is spent for rent, what is the total monthly income in dollars? 5.....
- Find the value of  $(2a)^3$  when  $a = -1$ . 6.....
- Express in *simplest form* the sum of  $a^2 + b - c$  and  $a^2 + c$ . 7.....
- If  $m = -8$ , then what is the value of  $|m|$ ? 8.....
- Two numbers are in the ratio 3:7. If their sum is 60, what is the *larger* number? 9.....
- Solve for  $a$ :  $\frac{a}{15} = \frac{a-1}{12}$  10.....
- Solve for  $x$  in terms of  $c$ ,  $b$ , and  $n$ :  $c = nx + b$  11.....
- Solve for  $n$ :  $n + 1.4n = 74.4$  12.....
- Find the solution set of  $x - (2x - 5) = 5$ . 13.....
- Factor:  $3x^2 - 7x - 6$  14.....
- Find the number of square inches in the area of a square with a perimeter of 12 inches. 15.....
- Express in *simplest radical form*:  $\sqrt{50} + 2\sqrt{2}$  16.....
- Find to the *nearest tenth* the value of  $\sqrt{12}$ . 17.....
- Express the product of  $\frac{2}{x-3}$  and  $\frac{x^2-9}{8}$  in *lowest terms*. 18.....
- Find the number of degrees in the angle of elevation of the sun when a boy 5 feet tall casts a shadow 5 feet long on the ground. 19.....

*Directions (20-30):* Write in the space provided the *number* preceding the expression that best completes *each* statement or answers *each* question.

20. The number of cents in the sum of  $d$  dollars and  $h$  half-dollars is (1)  $d + h$  (2)  $10d + h$  (3)  $d + 50h$  (4)  $100d + 50h$  20.....

21. Which of the following is an infinite set? (1) {all people now living on this earth} (2) {1, 2, 3, ..., 1,000,000} (3) {all blades of grass in Kentucky} (4) {all even integers} 21.....

22. What is the solution set of  $\frac{1}{4}x^2 = 1$ ? (1)  $\{-2\}$  (2)  $\{2\}$  (3)  $\{2, -2\}$  (4)  $\{\frac{1}{2}, -\frac{1}{2}\}$  22.....

23. The fact that (3)  $(4 + 2) = (3)(4) + (3)(2)$  is an illustration of the (1) associative property of addition (2) commutative property of multiplication (3) distributive property of multiplication over addition (4) additive property of zero 23.....

24. The fraction  $\frac{18x^2y^3}{-6xy^4}$  is equivalent to (1)  $\frac{-3x^2}{y}$   
 (2)  $-\frac{3x}{y}$  (3)  $\frac{12x}{-y}$  (4)  $-\frac{3x^3}{y^7}$  24.....

25. A set of numbers that has the closure property under division is the set of (1) positive rational numbers (2) integers (3) whole numbers (4) natural numbers 25.....

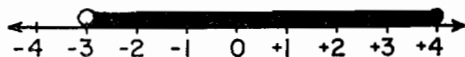
26. Rounded to the nearest tenth, 46.97 would equal (1) 46.0  
 (2) 46.10 (3) 46.9 (4) 47.0 26.....

27. The graph of which equation has a slope of  $-2$  and a  $y$ -intercept of  $4$ ? (1)  $y = -2x - 4$  (2)  $y = -2x + 4$   
 (3)  $y = 4x - 2$  (4)  $y = 4x + 2$  27.....

28. The expression  $\frac{3}{2x} - \frac{4}{5x}$  is equivalent to (1)  $\frac{7}{10x}$   
 (2)  $-\frac{1}{3x}$  (3)  $-\frac{1}{10x}$  (4)  $7x$  28.....

29. The solution set of  $\{y \mid 3y - 3 > 12\}$  is (1)  $\{y \mid y > 3\}$   
 (2)  $\{y \mid y < 3\}$  (3)  $\{y \mid y > 5\}$  (4)  $\{y \mid y < 5\}$  29.....

30. The diagram below is the graph of which inequality?



(1)  $-3 < x < 4$  (2)  $-3 > x$  or  $x < 4$  (3)  $-3 < x \leq 4$   
 (4)  $-3 \leq x < 4$  30.....

## Part II

Answer four questions from this part. Show all work unless otherwise directed.

31. Solve graphically and check: [8, 2]

$$2x + y = -1$$

$$x - y = -5$$

32. Write an equation or a system of equations which can be used to solve each of the following problems. In each case state what the variable or variables represent. [Solution of the equations is not required.]

a The sum of the squares of three consecutive positive integers is 29. Find the three integers. [5]

b The width of a rectangle is 9 inches less than its diagonal. The length of the rectangle is 15 inches. How long is the diagonal? [5]

33. Answer either a or b but not both: [Only an algebraic solution will be accepted.]

a The area covered by 16 square-shaped tiles is equal to the area covered by 9 square-shaped tiles whose sides are each 1 inch longer. Find the length of a side of the smaller tiles. [5, 5]

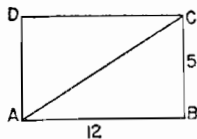
b A father can do a certain job in  $x$  hours. His son takes twice as long to do the job. Working together they can do the job in 6 hours. How many hours does it take the father to do the job alone? [5, 5]

34. In the accompanying figure  $ABCD$  is a rectangle. Side  $AB$  is 12 and side  $BC$  is 5.

a Find the length of diagonal  $AC$ . [3]

b Find, to the nearest degree, the measure of angle  $BAC$ . [4]

c Find the area of triangle  $ABC$ . [3]



35. A man took a car trip of 520 miles. One-third of the time he traveled at an average rate of 60 miles per hour. The remainder of the time he drove at an average rate of 35 miles per hour. What was the total number of hours he drove? [Only an algebraic solution will be accepted.] [5, 5]

36. Answer both a and b:

a Perform the indicated operation and express the result in simplest

form: [4] 
$$\frac{x^2 - 100}{y^2} \div \frac{x^2 + 7x - 30}{y^2}$$

b Find algebraically the common solution to the following system of equations, and check: [4, 2]

$$2x + y = 2$$

$$x - \frac{y}{2} = 9$$

37. On your answer paper write the letters *a* through *e* and next to each letter write the number of the property, *chosen from the list below*, which justifies *each* of the statements *a* through *e* below: [10]

*Properties*

- (1) Commutative property of addition
- (2) Addition property of zero
- (3) Associative property of addition
- (4) Additive inverse property
- (5) Commutative property of multiplication
- (6) Distributive property
- (7) Associative property of multiplication

*a*  $xy = yx$

*b*  $x(yz) = (xy)z$

*c*  $x(y + z) = xy + xz$

*d*  $x + (-x) = 0$

*e*  $x + y = y + x$

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